from breaking suddenly in a manner similar to that of monolithic glass-ceramic bodies.

TABLE III

| Example | Press Temp. | MOR (25° C.) | MOR (1300° C.) | MOR (1325° C.) | MCY |
|---|---|---|---|---|---|
| 1 | 1340° C. | 81 | 54 | 40 | 42 |
| 2 | 1350° C. | 60 | 41 | 28 | 45 |
| 5 | 1350° C. | 94 | 67 | 63 | 45 |
| 13 | 1370° C. | 71 | 66 | 65 | 31 |
| 15 | 1300° C. | 115 | 71 | 74 | 39 |
| 17 | 1340° C. | 127 | 49 | — | 35 |

The significant effect which $As_2O_3$ has upon room temperature modulus of rupture is evident from a comparison of Example 1 with Example 17. The base compositions of the two products are the same, but Example 17 has 1% $As_2O_3$ as opposed to 0.5% in Example 1.

Hybrid composite articles, that is, articles containing both SiC whiskers and SiC continuous fibers were produced in accordance with the description in U.S. Pat. No. 4,615,987. Thus, a homogeneous suspension containing 15% by weight deagglomerated SiC whiskers was prepared from frit obtained from Example 1, using the above-described shear mixing technique. After drying, the mixture was blended into an organic binder and vehicle solution to form a slurry such as is also described above with respect to the fiber-containing composites. A prepreg was prepared by passing continuous SiC fiber through that slurry. Several prepregs were stacked and the organic components burned out. The stack of prepregs was hot pressed in a graphite mold having a molybdenum liner for 10 minutes at a pressure of 1500 psi and at a temperature of 1340° C. in an atmosphere of flowing nitrogen. The mold was cooled to 1200° C. and held at that temperature for two hours. The fiber content of the articles averaged about 35% by volume. Table IV provides a comparison of the mechanical properties of those products measured in terms of psi with those exhibited by composites prepared from Example 1 reinforced with 35% by volume fibers using the same processing conditions.

TABLE IV

| | Hybrid | Fibers |
|---|---|---|
| MOR (25° C.) | 67,000 | 78,000 |
| MOR (1300° C.) | 108,000 | 58,000 |
| MCY (25° C.) | 54,000 | 35,000 |

The anomalous low room temperature MOR of the hybrid body was due to poor homogeniety of the green (unfired) body and fiber damage. The presence of whiskers led to an improvement in the MCY stress at room temperature. The tremendous increase in MOR at 1300° C. is believed to be the result of more effective load transfer to the fiber by the hybrid matrix compared to the whisker-free matrix.

Although the above description of hybrid composites employed SiC fibers (and the use of such fibers comprises the preferred embodiment), it will be appreciated that other inorganic fibers can be utilized in like manner. Examples of operable fibers include $B_4C$, carbon, mullite, $Si_3N_4$, spinel, $Al_2O_3$, BN, $ZrO_2$, and zircon.

We claim:

1. An integral whisker-reinforced, internally-nucleated glass-ceramic matrix composite of essentially full density having a use temperature in excess of 1300° C. consisting essentially of 5–60% by weight deagglomerated SiC whiskers having a thickness less than 100 microns with a length-to-diameter ratio of at least 5 substantially uniformly distributed in a glass-ceramic essentially free of $TiO_2$ and consisting essentially, expressed in terms of weight percent on the oxide basis, of 16–20% CaO, 38.5–46% $Al_2O_3$, 35–42% $SiO_2$, 0.25–1.5% $As_2O_3$, and up to 10% total of at least one nucleating agent in the indicated proportion selected from the group consisting of 0.1–3% $Cr_2O_3$, 0.25–3% $HfO_2$, 2–5% $MoO_3$, 0.25–3% $Nb_2O_5$, 0.25–3% $Ta_2O_5$, 0.25–3% $WO_3$, and 1–10% $ZrO_2$, wherein $Al_2O_3$ is present in an amount which is at least 10 mole percent and up to 50 mole percent in excess of that present in stoichiometric triclinic anorthite, and wherein the predominant crystal phases in the glass-ceramic matrix are triclinic anorthite and mullite and/or $\alpha$-$Al_2O_3$.

2. A composite according to claim 1 consisting essentially, expressed in terms of weight percent on the oxide basis, of 16–18% CaO, 40–46% $Al_2O_3$, 35–38% $SiO_2$, and 0.5–1.0% $As_2O_3$, plus nucleating agent.

3. An integral fiber-reinforced, internally-nucleated glass-ceramic matrix composite of essentially full density having a use temperature in excess of 1300° C. consisting essentially of 15–70% by volume SiC fibers substantially uniformly distributed in a glass-ceramic essentially free of $TiO_2$ and consisting essentially, expressed in terms of weight percent on the oxide basis, of 16–20% CaO, 38.5–46% $Al_2O_3$, 35–42% $SiO_2$, 0.25–1.5% $As_2O_3$, and up to 10% total of at least one nucleating agent in the indicated proportion selected from the group consisting of 0.1–3% $Cr_2O_3$, 0.25–3% $HfO_2$, 2–5% $MoO_3$, 0.25–3% $Nb_2O_5$, 0.25–3% $Ta_2O_5$, 0.25–3% $WO_3$, and 1–10% $ZrO_2$, wherein $Al_2O_3$ is present in an amount which is at least 10 mole percent and up to 50 mole percent in excess of that present in stoichiometric triclinic anorthite, and wherein the predominant crystal phases in the glass-ceramic matrix are triclinic anorthite and mullite and/or $\alpha$-$Al_2O_3$.

4. A composite according to claim 3 consisting essentially, expressed in terms of weight percent on the oxide basis, of 16–18% CaO, 40–46% $Al_2O_3$, 35–38% $SiO_2$, and 0.5–1.0% $As_2O_3$, plus nucleating agent.

5. An integral fiber- and whisker-reinforced, internally-nucleated glass-ceramic matrix hybrid composite body of essentially full density having a use temperature in excess of 1300° C. consisting essentially of about 15–70% by volume fibers selected from the group consisting of SiC, carbon, $B_4C_1Si_3N_4$, BN, mullite, spinel, $Al_2O_3$, zircon, and $ZrO_2$ and 5–60% by weight deagglomerated SiC whiskers having a thickness less than 100 microns with a length-to-diameter ratio of at least 5 substantially uniformly distributed in a glass-ceramic matrix essentially free of $TiO_2$ and consisting essentially, expressed in terms of weight percent on the oxide basis, of 16–20% CaO, 38.5–46% $Al_2O_3$, 35–42% $SiO_2$, 0.25–1.5% $As_2O_3$, and up to 10% total of at least one nucleating agent in the indicated proportion selected from the group consisting of 0.1–3% $Cr_2O_3$, 0.25–3% $HfO_2$, 2–5% $MoO_3$, 0.25–3% $Nb_2O_5$, 0.25–3% $Ta_2O_5$, 0.25–3% $WO_3$, and 1–10% $ZrO_2$, wherein $Al_2O_3$ is